HOUSATONIC RIVER FLOOD CONTROL

EAST BRANCH
DAM & RESERVOIR

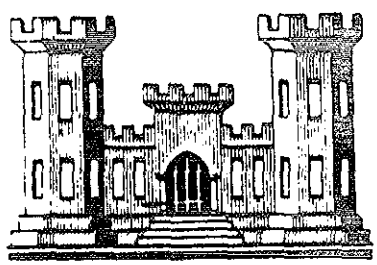
EAST BRANCH NAUGATUCK RIVER

(UPPER NAUGATUCK RIVER, ABOVE TORRINGTON)

CONNECTICUT

DESIGN MEMORANDUM NO.2

SITE GEOLOGY



U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

DECEMBER 1961

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM 54, MASS.

18 December 1961

NEDGW

SUBJECT: East Branch Dam and Reservoir - East Branch Naugatuck River - Housatonic River Basin, Connecticut - Design Memorandum No. 2 - Site Geology

TO: Chief of Engineers
Attention: ENGCW-E
Department of the Army
Washington, D. C.

There are submitted for review and approval ten (10) copies of Design Memorandum No. 2 - Site Geology for the East Branch Dam and Reservoir - East Branch Naugatuck River - Housatonic River Basin, Connecticut, in accordance with EM 1110-2-1150.

FOR THE DIVISION ENGINEER:

John Wm Leslie

Incl (10 cys)
Design Memo No. 2

JOHN WM. LESLIE
Chief, Engineering Division

FLOOD CONTROL PROJECT

EAST BRANCH DAM AND RESERVOIR

EAST BRANCH NAUGATUCK RIVER

HOUSATONIC RIVER BASIN
CONNECTICUT

DESIGN MEMORANDA INDEX

Number	Title	Submission Date	Approved
1	Hydrology & Hydraulics Analysis	20 Nov 1961	7 Dec 61
2	Site Geology	18 Dec 1961	
3	General Design	18 Dec 1961	
4	Relocations	21 Nov 1961	
5	Concrete Materials	20 Nov 1961	7 Dec 61
6	Embankment & Foundations		
7	Detailed Design of Structures		

FLOOD CONTROL PROJECT

EAST BRANCH DAM AND RESERVOIR

EAST BRANCH NAUGATUCK RIVER

HOUSATONIC RIVER BASIN

CONNECTICUT

DESIGN MEMORANDUM NO. 2

SITE GEOLOGY

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EAST BRANCH DAM AND RESERVOIR

SITE GEOLOGY

DECEMBER 1961

A. DESCRIPTION OF PROJECT

1. The East Branch Dam and Reservoir Project is located on the East Branch of the Naugatuck River, 3.0 miles upstream of its confluence with the West Branch in the city of Torrington, Connecticut.

2. As shown on the General Plan and Reservoir Map, Plate No. 2-1, the project consists of an earth fill dam approximately 700 feet in length and having a maximum height of 100 feet. A chute type spillway is located on the right abutment, and an outlet conduit is located along the toe of the right abutment.

B. GENERAL TOPOGRAPHY AND GEOLOGY

3. The region drained by the Naugatuck River and its tributary system, of which the East Branch is a part, is located in the Highlands of Western Connecticut. This is a region of moderate but sharp relief characterized by steep-sided valleys and broad, flat-topped plateau remnants, the surfaces of which slope gently to the southeast. The topography is controlled largely by the underlying crystalline bedrock which outcrops extensively through a variably thin cover of glacial till on the upper slopes and tops of the hills and ridges. The bottoms of most of the main valleys have been choked with glacial outwash, remnants of which appear as flood plains and terrace features. Many of

the present streams are flowing upon this outwash material. In some places, the streams, in their post-glacial meandering, have cut through the till and outwash exposing bedrock in the sides and bottoms of the valleys. The bedrock of the region comprises intricately folded and faulted granites, gneisses and schists ranging from pre-Cambrian to Paleozoic in age. Structurally these rocks display a generally north-south trend and a steep westerly dip. In the vicinity of the East Branch project the rocks are considered to be a part of the Becket (gneiss) formation, a pre-Cambrian complex.

C. DESCRIPTION OF SITE

4. The river enters the project area from the north through a relatively broad flood plain. At the site the valley narrows abruptly, being constricted between steep, till-covered, bedrock slopes. The left valley slope rises rather steeply from the river's edge. On the right, a low bench, some 250 feet in width, slopes gently up from the river to the toe of the steep valley wall. Because of the generally thin overburden cover, bedrock outcrops are common to the steeper slopes, particularly on the right side of the river. Limited exposures are also present in the river bed at the centerline and along the right bank a short distance downstream. The ground surface of the entire site is variably strewn with boulders, and concentrations of large boulders and blocks occur downslope of rather extensive bedrock outcroppings on both abutments, and in the river channel. The entire dam site is heavily wooded, while the reservoir area is generally devoid of forestation.

D. SURFICIAL AND SUBSURFACE INVESTIGATIONS

5. Previous Investigations. Geologic reconnaissance and three (3) subsurface explorations were made in 1956 for preparation of an interim survey report entitled, Housatonic River Basin, Upper Naugatuck River, Above Torrington, Connecticut.

6. Current Investigations. Detailed geologic reconnaissance was made in April 1961 to study the general surface conditions and to determine as far as practicable, locations best suited to the construction of the spillway and outlet works structures. At the same time consideration was given to planning an exploration program of design scope. Additional preliminary explorations consisting of two (2) foundations borings were also made in April 1961 by the Corps of Engineers. Foundation exploration for final design, consisting of twenty-six (26) borings, was completed by contract with Sprague and Henwood, Inc., Scranton, Pa. during the period June - August 1961. Two (2) additional foundation borings were made by the Corps of Engineers in October 1961. The locations of all of these borings are shown on the Plan of Foundation Explorations, Plate No. 2-2. All borings were made by continuous drive sampling methods in overburden and, where encountered, bedrock was cored with NX bits and maximum recovery type core barrels. Hydraulic pressure testing of the rock was conducted in borings at structure locations and along the centerline of the dam. Detailed classification and description of materials encountered in all foundation explorations, and all pressure test data are

shown on the Record of Foundation Explorations, Plates No. 2-6 and 2-7.

7. Extensive reconnaissance and investigation was made to locate a source of suitable impervious borrow material. One (1) boring was made in the area immediately downstream of the left abutment of the dam. Bedrock was encountered, however, at a depth of less than 10 feet and investigations were suspended in this area. Ten (10) borings and a bull-dozed trench were completed in an area on the left side of the river approximately one mile upstream of the dam site, as shown on the General Plan and Reservoir Map, Plate No. 2-1. The locations of these explorations are shown on the Plan of Borrow Explorations, Plate No. 2-8. Overburden was continuously drive-sampled in the borings and all refusals were diamond drill-cored for a minimum penetration of 10 feet to ascertain the presence of bedrock. Observation wells were installed in seven of the ten borings. The classification and description of materials encountered in all the borings and the trench, and the depth of the observation wells are shown on the Record of Borrow Explorations, Plate No. 2-9. Additional explorations are scheduled to be made in the upstream area to further delineate the nature and extent of materials.

E. SURFICIAL GEOLOGY

8. At the dam site the entire valley section is controlled by bedrock, which, occurring at or near the surface, forms steep rough-sided

abutments and a narrow valley bottom. Between the river and the toe of the right abutment is a gently sloping bench, the surface of which rises some 10 to 30 feet above the river. The river, flowing against the toe of the left abutment, is at or close to bedrock in the site area.

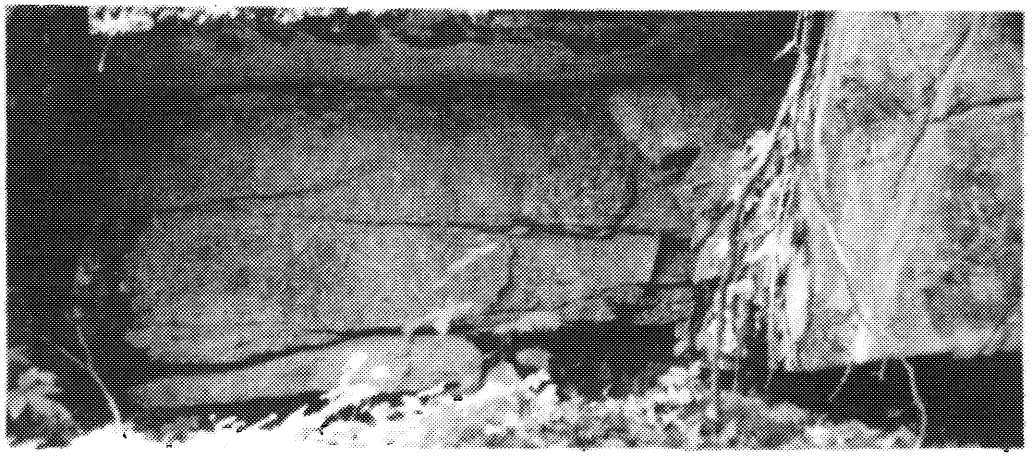
9. Overburden, consisting of glacial till-like silty sands and gravels with numerous cobbles and boulders, overlies the bedrock at relatively shallow depths throughout the site area. Accumulations on the upper right abutment are particularly thin and spotty due to the presence of numerous and extensive bedrock outcrops. Thickest accumulations occur locally in the valley bottom and on the left abutment. Extensive concentrations of large boulders and blocks are present in the river bed and on the surface, downslope of the outcrops on both abutments. Scattered surface boulders occur elsewhere throughout the site area. In the reservoir, the valley floor is underlain to a large degree by glacial outwash deposits consisting of silty sands and bony gravels, capped in some places by recent alluvium.

10. Bedrock is exposed over a wide area on the upper right abutment, and to a limited extent in the river and on the left abutment. The actual amount of exposed bedrock may vary considerably from that indicated on the Plan of Foundation Explorations, Plate No. 2-2 since small outcrops are not always distinguishable from the large boulders and blocks which litter the ground surface in many places. The bedrock consists principally of granite gneiss with included

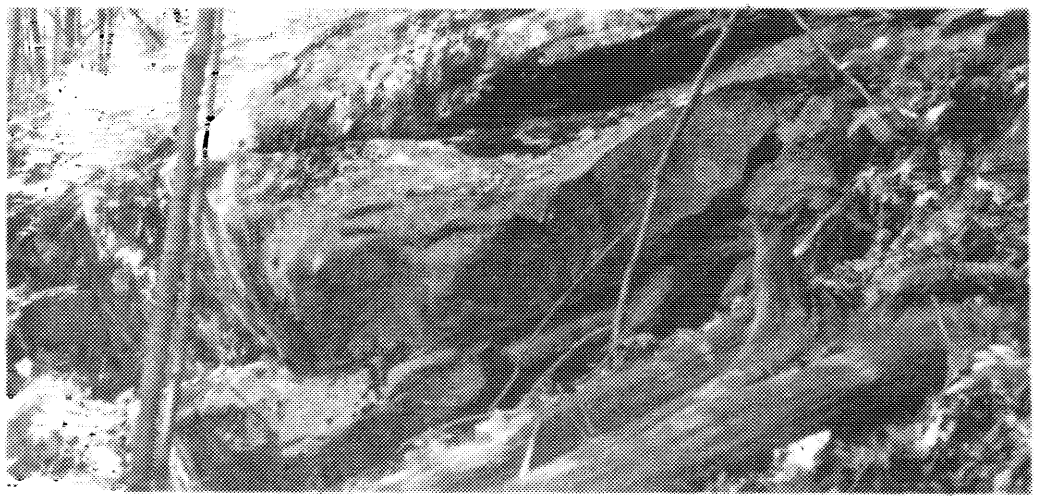
stringers and zones of biotite schist, interlayered with beds of biotite-hornblende schist. Structurally, these rocks trend roughly north-south and have a variably steep, locally contorted, westerly dip. A pronounced system of near vertical joints is apparent in bedrock exposures in the river bed and on the abutments. This system comprises two major joint sets, one trending northeast-southwest and the other northwest-southeast. In each case the major sets are represented by two slightly divergent joint planes. A prominent system of variably close-set, low angle (0^{o} - 15^{o}) joints is also apparent in these outcrops, particularly those on the abutments. This intersecting joint pattern, and the resultant blocky nature of the rock are well displayed in the abutment exposures (see Figure 1), and in the river bed.

F. FOUNDATION CONDITIONS

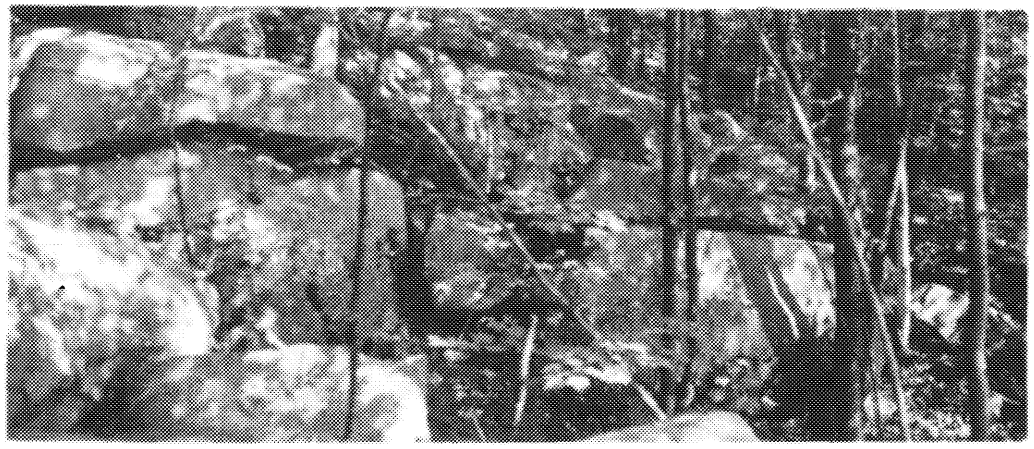
11. Overburden. The till-like materials which mantle the bedrock surface in the site area vary considerably in composition, ranging from thin zones of sandy silt to rather substantial sections of nested cobbles and boulders. Silty sand and silty gravelly sand with varying amounts of included cobbles and boulders, comprise the major portion of these materials. Numerous other combinations of silt through cobble fractions occur over a wide area but to a lesser degree. Drive sampling data generally indicate these materials to be moderately compact. However, this inferred degree of compactness was influenced considerably in many places by the presence of cobbles and boulders.



RIGHT ABUTMENT



RIGHT ABUTMENT



LEFT ABUTMENT

TYPICAL BEDROCK EXPOSURES

FIGURE 1

In general these materials range from 3 to 15 feet in thickness but thicknesses of as much as 25 feet occur locally where the materials rest in troughs and pockets in the bedrock surface. The predominant silty and gravelly sands, and accompanying thin zones of sandy silt and numerous cobbles, generally rest directly upon the bedrock. In a few places, however, they are separated from the bedrock by fairly substantial sections of nested cobbles and boulders. In places where the boulders constitute nearly the entire section of overburden they form extensive surface concentrations. Such concentrations occur on both abutments downslope of the area of extensive outcroppings to approximately elevation 840 feet. At still a few other locations the sandy materials rest on and are mixed with soft, micaceous, decomposed to badly weathered rock. The nature, thickness and extent of these materials is shown on the Record of Foundation Explorations, Plates No. 2-6 and 2-7, and the Geologic-Log Sections, Plates No. 2-3 through 2-5.

12. On the left abutment the overburden is generally less than 10 feet thick, but thicknesses in excess of 15 feet are not uncommon. Thickest accumulations occur near the middle of the abutment, at and downstream of the centerline of the dam. In the vicinity of boring FD-27 some 9 feet of nested cobbles and boulders are present just above bedrock. At the location of boring FD-33 the sandy materials are resting on some 17 feet of decomposed to badly weathered rock. On the right abutment the overburden ranges from 3 to 10 feet in thickness downslope of the extensive outcrop area. In and above this area

the overburden cover is extremely thin and spotty. Sandy silt is somewhat more prevalent on this abutment than on the left but its occurrence and extent are inconsequential.

13. In the floor of the valley, overburden materials range generally from less than 5 to about 15 feet in thickness. Thicknesses increase in a downstream direction with heaviest accumulations occurring along the right side of the river, at and below the downstream toe of the embankment. Cobble and boulder concentrations of 5 to over 8 feet in thickness are present in the vicinity of borings FD-26 and FD-3. At the latter location they rest in a pocket of undetermined size and are overlain by some 18 feet of silty gravelly sand.

14. Bedrock. Bedrock in the site area, as exposed in extensive abutment and river bed outcrops and in rock cores, consists principally of granite gneiss with included zones and phases of biotite schist, intercalated with beds of biotite-hornblende schist. These rocks vary widely in texture and composition since they have been much intruded and highly metamorphosed. The gneiss, though normally banded, is locally quartzose and granular, and in some places the gneissoid structure is so poorly developed that the rock can be classed as granite. Also included is an extremely coarse-grained phase characterized by pink feldspar. Where the gneissoid bands are very thin the rock grades into biotite schist. The biotite-hornblende schist, which originated from intruded diorites and gabbros, occurs in beds ranging from a few to many feet in thickness. All of these rocks have been further intruded

by veins of quartz and pegmatite. Compressive forces acting from the southeast have deformed these rocks and produced a distinct schistosity which, in the site, area, trends north-northeast and dips westerly at 50 to 70 degrees. Due to the high degree of deformation in these rocks, dips of 85 degrees or more do occur locally. Because of the steeply inclined attitude of the beds, and the differences in the manner and rate of weathering of the gneiss and schist, the bedrock surface is generally rough and irregular. In some places where the schist occurs as the surface rock, as in borings FD-31 and FD-33, the nominal bedrock surface is overlain by a substantial zone of decomposed rock. Where the gneissic rock occur at the top, the bedrock surface is characterized in many places by the presence of detached or semi-detached blocks, as a result of prominent, intersecting, high angle and horizontal joint sets. This jointing characteristic is further manifested in the concentrations of large blocks resting downslope of the outcrops.

15. Rock structure observed in outcrops and cores indicates the rock to be generally fresh and hard though closely jointed and variably fractured, particularly in the top 20 feet. In many places the top 5 to 10 feet is highly fractured and open, and silt fillings are quite common. Weathering is moderate to severe in this zone, below which it is generally confined to scattered, thin zones of close jointing, and as staining on the surfaces of individual open joints and foliation partings.

Slight mineralization is apparent locally on joint surfaces and in small solution cavities. Minor slippage or mild localized movement was also observed at four widely separated locations. At three locations, movement is evidenced by low order, isolated slickensides on foliation surfaces, and at the fourth, by the presence of talcose material on the surfaces of a high angle joint. No positive correlation could be drawn, however, from these limited occurrences. The nature, condition and extent of the bedrock in the site area is shown on the Record of Foundation Explorations, Plates No. 2-6 and 2-7 and the Geologic-Log Sections, Plates No. 2-3 through 2-5.

16. Hydraulic pressure testing was conducted in borings at structure locations and along the centerline of the dam. Water losses on the order of 5 to 15 GPM at pressures of 0 to 20 PSI were recorded to depths of approximately 20 feet, indicating a rather open condition in this zone. The relatively high losses in this zone are considered to be largely attributable to the numerous and pronounced horizontal joints. Below this zone losses were either insignificant or not measurable at pressures of 30 to 50 PSI. Zones tested and the losses recorded therein are shown on the Record of Foundation Explorations, Plates No. 2-6 and 2-7 and Geologic-Log Sections, Plates No. 2-3 through 2-5.

G. SUBSURFACE WATER

17. Levels of subsurface water were observed in borings during drilling operations and are indicated by symbol on the Record of Foundation Explorations, Plates No. 2-6 and 2-7. On both abutments these levels occur generally at 10 to 15 feet below the bedrock surface. In the valley bottom the levels are for the most part at or slightly above river level. Adjacent to the river they occur within the overburden, while in the low bench lying between the river and the right abutment they occur just below the bedrock surface. A slight artesian flow was encountered at a depth of approximately 8 feet in boring FD-32 located in the river. This flow, some 1.5 GPM, stabilized at a head of 2.6 feet above ground surface, or 1.3 feet above river surface. Drill casing was left in place in this boring to permit further observations.

H. RESERVOIR LEAKAGE

18. A permanent storage pool is not proposed for this project. The flood control reservoir is completely enclosed by high, wide, bedrock ridges along the crests of which there are no low or pervious saddles. Some leakage will occur through the overburden and upper 10 to 20 foot zone of jointed and fractured rock beneath the dam and appurtenent structures. This will be controlled by a cut-off through the overburden, supplemented by area and curtain grouting in the rock.

I. CONSTRUCTION MATERIALS

19. General. The proposed embankment for the dam will consist of a compacted earth fill composed to glacial till from borrow excavation, blanketed with rock fill on the upstream slope and protection stone on the downstream slope, both of which will be obtained from required excavation. Internal drainage features consisting of a wick, a gravel blanket between the blanket and the rock and a gravel bed for the rock sections, will be constructed of pervious materials to be furnished by the contractor. An upstream cut-off and grout curtain, and a rock fill section at the downstream toe of the embankment will provide additional seepage control.

20. Impervious Materials. Materials suitable for construction of the compacted fill section of the embankment are available in required quantity in the borrow area shown on the General Plan and Reservoir Map, Plate No. 2-1. These materials comprise a characteristically variable deposit of glacial till which occurs in two distinct zones, an upper and a lower. The upper zone is generally 10 to 15 feet thick and consists mainly of loose to medium compact, brown, silty sand and gravelly silty sand. The lower zone or main till deposit is substantially thicker, from 10 to over 30 feet, and consists principally of compact to very compact, grey, gravelly silty sand with cobbles and scattered boulders. Included in this lower zone are sections of silty gravelly sand, thin layers of sandy silt, seams of relatively clean sand and traces of clay. From observations made

in the test trench during excavation, and in observation wells over a period of six months, it appears that there is a zone of perched water on top of the lower zone of till. Also, that lesser amounts of subsurface water are percolating through at least some of the sand seams in the lower till. For this reason drainage will have to be provided during excavation to keep the area and materials dry and workable. No unusual difficulties are anticipated in excavation of these materials.

21. Pervious Materials. All pervious materials required for construction of the internal drainage features will be furnished by the contractor. Adequate supplies of suitable materials are available from several commercial sources located along State Route No. 8, some 3 to 10 miles northeast of the project. Materials from these sources were tested and approved for use on the Hall Meadow Project but were never used.

22. Rock Fill. Rock from required excavation will be generally suitable for construction of rock fills and for slope protection. Total excavation quantities are large enough to assure the availability of required quantities of sound rock. It is estimated that some 5 percent of the excavated rock will probably be unsuitable for use in embankment construction due largely to the thin foliation and tendency toward slabby fragmentation of the biotite-hornblende schist. In general the blocky nature of most of the rock, created by its variably close-set and roughly cubical joint pattern, should produce a fairly well graded material. This,

together with the inherent durability of most of the rock, and particularly the gneiss, indicates that a bulking factor of approximately 40 percent may be reasonably assumed. Some reduction in this bulking factor will result from wear due to vehicular traffic during placement of the rock fills, and from stockpiling and rehandling of the material.

23. Concrete Aggregates. An estimated 2000 cubic yards of concrete will be required for the spillway weir, walls and conduit. In view of the small volume of concrete involved, aggregates will be obtained commercially. Aggregate studies made for other projects recently completed or under construction in this same general area indicate that approved materials are available from several such sources within a 25 mile haul distance of the project.

Complete test data on concrete aggregates are contained in Design Memorandum No. 5, Concrete Materials, dated November 1961.

J. CONCLUSIONS AND RECOMMENDATIONS

24. No unusual problems of an engineering geology nature are anticipated during construction. Full consideration is being given to all geologic factors bearing on excavations, foundations and leakage. Materials suitable for use in construction of the major portion of the dam are available from required excavations and the borrow area shown on the General Plan and Reservoir Map, Plate No. 2-1. Special materials for the drainage features and concrete aggregate are available from a number of nearby commercial sources.

25. In accordance with established practice of this Division, a digest of geologic factors pertinent to the design and construction of the project will be furnished to field construction personnel for information, guidance and instruction for the work. This digest will point out the availability of geology personnel for field consultation, particularly at the outset and during major or critical excavations and during grouting operations.

26. A roughly cubical joint pattern and steeply inclined foliation are the most significant characteristics of the rocks in the project area as they will exercise considerable control on breakage, slope excavation and seepage. This control will be effected largely by the tendency of the rock to break along these natural lines of weakness, and the fact that excavation lines for the spillway and conduit will generally parallel the trend of the bedrock structure. Therefore, ultimate slopes and their condition will be governed to a considerable degree by this relationship of excavations to the controlling bedrock structure. These controlling factors are further complicated in the area of the spillway weir by the presence of rather extensive zones of biotite-hornblende schist, indicated by rock core taken in borings FD-9 and FD-15, smaller amounts of which were also encountered in borings FD-7 and FD-17. Special consideration should be given to all excavations in the top 20 feet of rock, and in areas where excavation slopes will approximate the dip of the foliation. Extreme care will be required in all excavations along the easterly or outboard

side of the spillway cut, particularly in the preparation of foundations for the concrete gravity wall adjacent to the weir. Excavations here, in addition to being down-dip, will be generally shallow due to the proximity of spillway grade to the steep easterly dipping bedrock surface. After considering all factors of rock structure and their influence on the control of final lines and slopes throughout project excavations, it is believed that the general quality of the rock is such that slopes of 4 vertical on 1 horizontal are feasible on the west or inboard side of the cuts. Slopes on the easterly side will vary with the dip of the rock structure, however, it is considered possible that final slopes may still average somehwere close to 4 on 1.

27. Overburden and loose rock will be removed for a distance of 10 feet back from the top of all rock cuts as a general safety measure. On down-dip slopes, this would permit observation of fractures and cleavages which could result in slips or slides. On the high westerly or inboard face of the spillway cut it will be necessary to either flatten the slope above the level of relatively sound rock, which point is some 15 to 20 feet below the bedrock surface, or make a 10 foot berm at approximately this same level. Since preservation of thin rock sections along the outboard side of the conduit may be rather difficult, it is considered practicable to excavate this rock down to a width that would provide a working access. Scaling will be required on all rock faces, and safety mesh, fastened with rock bolts, will be used on all faces over 20 feet in height. Provision will be made for the use of rock bolts

with possible need for application on the down-dip slopes in the spillway cut.

28. Rock structure along the lines of excavation is not generally adaptable to effective line drilling. However, provisions for line drilling will be included in the specifications for use in certain structure excavations with provisions for discontinuance if attained results are no more satisfactory than those which can be accomplished with a normal close pattern of drilling.

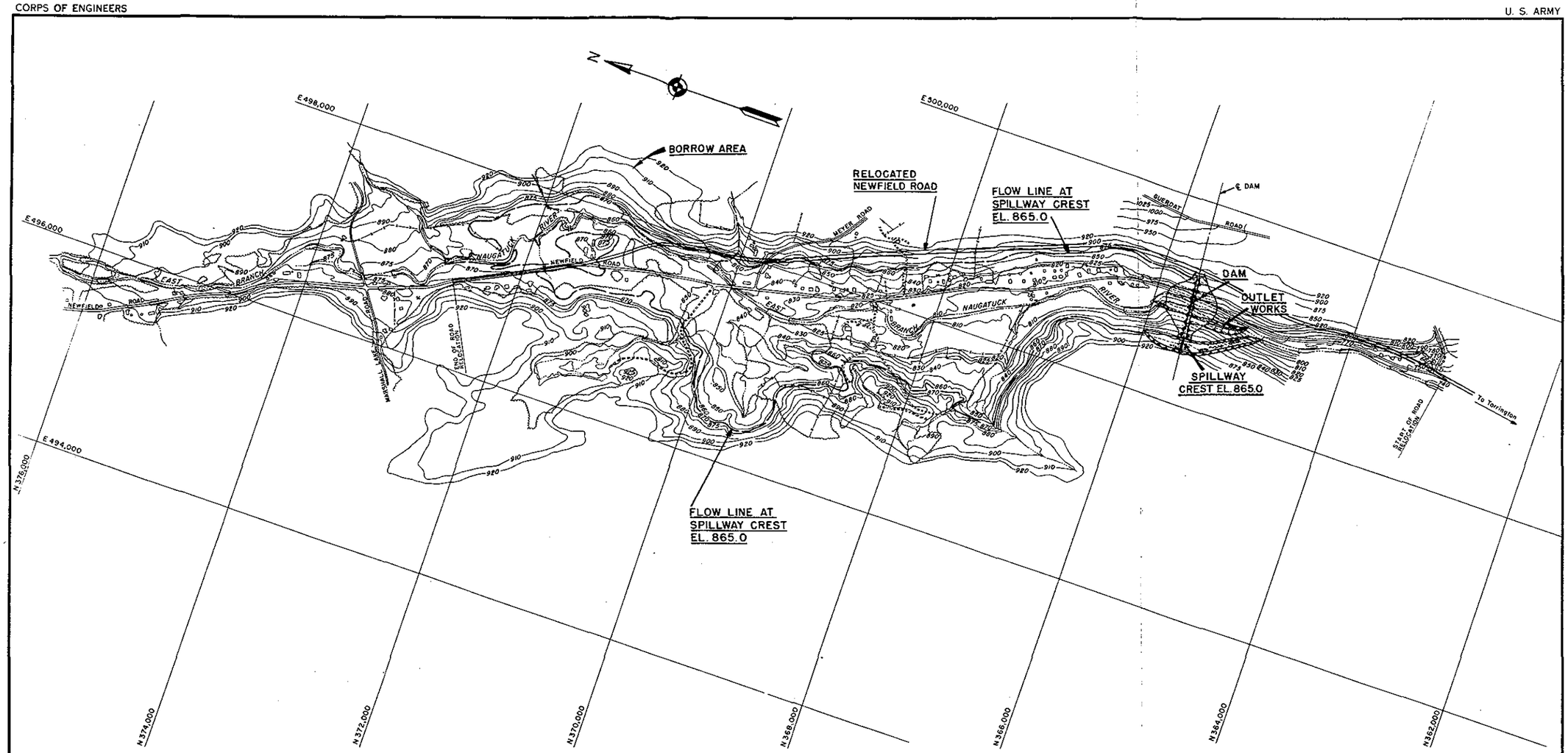
29. Hydraulic pressure test data and rock cores from exploratory borings reveal that some grouting will be necessary in the top 10 to 20 foot zone of rock to aid in the control of seepage and reduction of uplift. Water losses recorded during the pressure testing operations indicate that the grout take will be generally moderate. Grouting beneath the spillway weir will be required only under the outer portion or area of relatively shallow rock excavation. A grout curtain will be constructed for the full length of the impervious cut-off under the dam and will connect with the curtain beneath the spillway weir. Some area grouting may also be necessary under the cut-off. This need will be governed, however, by final embankment design and actual conditions exposed in excavation of the cutoff trench. Uplift pressures will be reduced by drain holes drilled into the rock as necessary for structures, walls and slabs. The steeply dipping foliation and pronounced horizontal

jointing inherent in rocks in the project area will impose some limitation on the distribution and effectiveness of anchors. Therefore, anchors will be inclined, or oriented wherever possible, in such relationship to the rock structure as will assure engagement of a maximum volume of rock.

30. Normal rock excavations are expected to produce a large quantity of material of suitable size and shape for use in rock fill and slope protection. Some slabby fragmentation will occur, however, in the areas of biotite-hornblende schist due to its linear structure, while undesireable fines will be produced by zones of heavy mica concentration which occur generally throughout much of the rock to be excavated.

CORPS OF ENGINEERS

U. S. ARMY



RESERVOIR PLAN

SCALE IN FEET

400' 0 400' 800'

NOTES:

Elevations refer to Mean Sea Level

Plane Coordinates refer to Connecticut Lambert Grid System.

For Detail of Borrow Area "A" see Plate No. 2-8

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DR BY C.A.V.	TR BY K.A.W.	CK. BY V.C.G.
SUBMITTED HEAD, GEOLOGY SECTION		
PROJECT ENGINEER		
APPROVAL RECOMMENDED CHIEF, SOILS & MATLS BRANCH		
APPROVAL RECOMMENDED CHIEF, PLANN. & RPTS BRANCH		

HOUSATONIC RIVER FLOOD CONTROL
EAST BRANCH DAM
GENERAL PLAN AND RESERVOIR MAP
EAST BRANCH NAUGATUCK RIVER CONNECTICUT

APPROVED DATE NOV 1961

CHIEF, ENGINEERING DIVISION

SCALE 1" = 400'

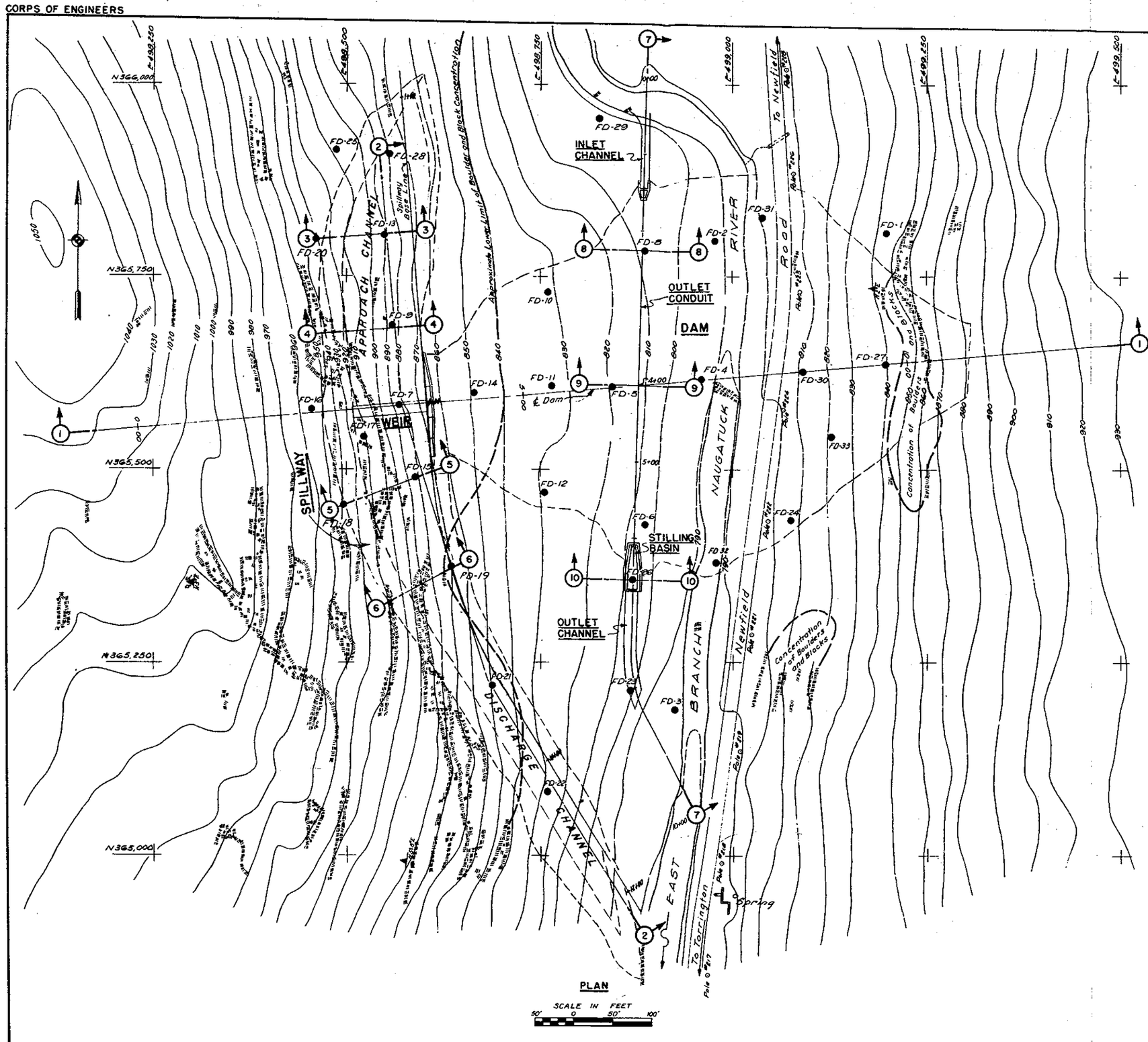
DRAWING NUMBER

SHEET

PLATE NO. 2-1

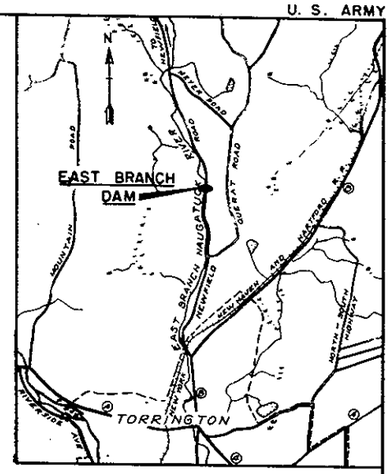
CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE IN FEET
50' 0 50' 100'



VICINITY MAP
SCALE IN MILES
0 1 Mile

LEGEND

- ● FD Foundation Test Boring
- Bedrock Outcrop
- Strike and Dip of Foliation
- Location and Direction of view for Geologic-Log Section

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval is 10 feet
Plane coordinates refer to Connecticut State Lambert System
For Record of Foundation Explorations, see Plates No. 2-6 and 2-7.
For Geologic Sections, see Plate No. 2-3, 2-4 and 2-5

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M.	DR. BY R.A.W.	CK. BY R.C.G.
SUBMITTED: R.C. Lockey, SECTION		
PROJECT ENGINEER		
APPROVAL RECOMMENDED: CHIEF, FOR & WAT'S BRANCH		
APPROVAL RECOMMENDED: CHIEF, PLANS & RPTS BRANCH		

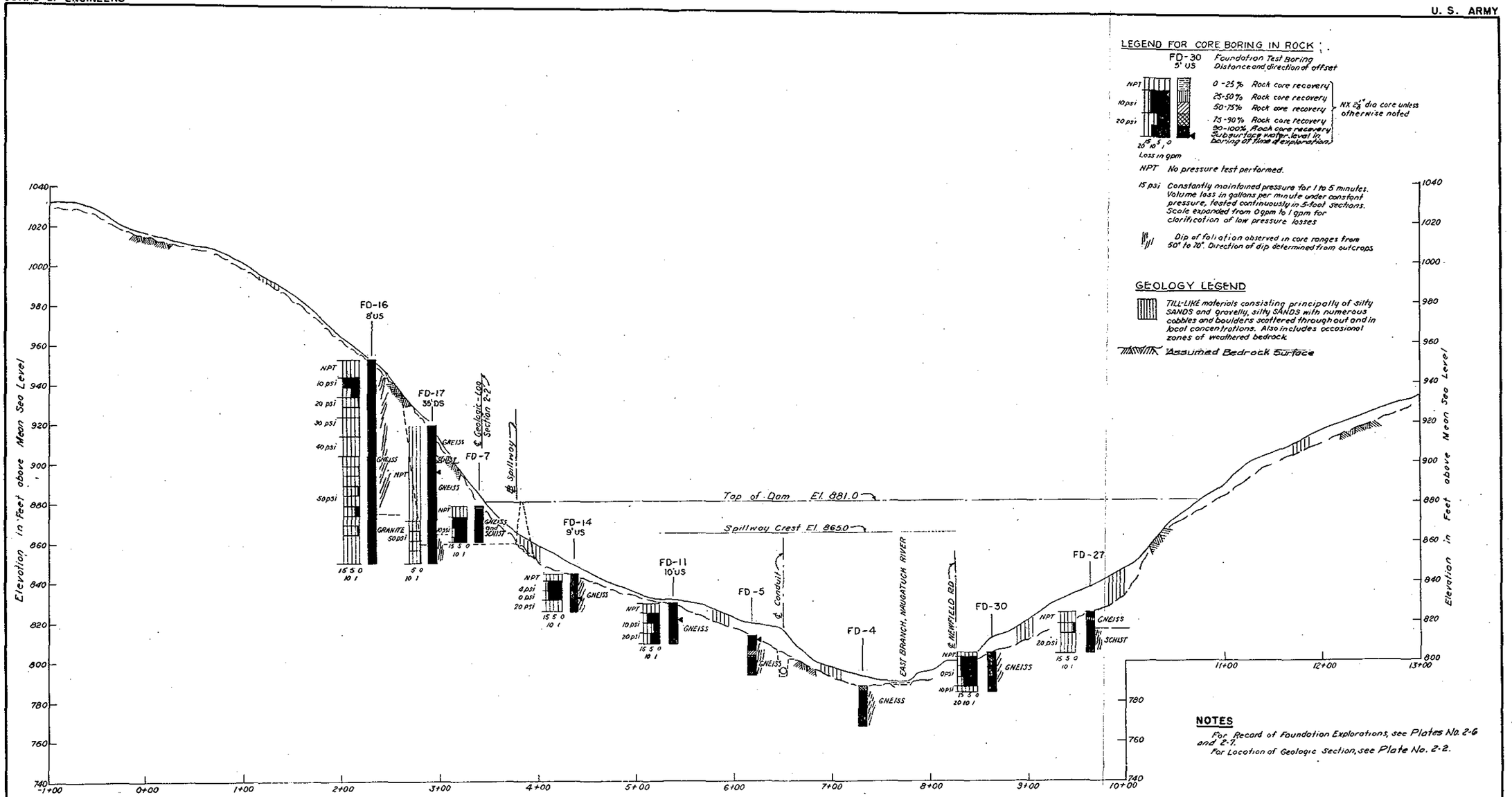
HOUSATONIC RIVER FLOOD CONTROL
EAST BRANCH DAM
PLAN OF FOUNDATION EXPLORATIONS
EAST BRANCH NAUGATUCK RIVER CONNECTICUT
APPROVED DATE NOV 1961
CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO. CIV. ENG.-19-065-
DRAWING NUMBER

PLATE NO. 2-2

CORPS OF ENGINEERS

U. S. ARMY



SECTION 1-1 ALONG ℄ OF DAM

(LOOKING UPSTREAM)

NOTES

For Record of Foundation Explorations, see Plates No. 2-6 and 2-7.

For Location of Geologic Section, see Plate No. 2-2.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M. | DR. BY R.A.W. | CK. BY R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOR & MAT'LS BRANCH
APPROVAL RECOMMENDED
CHIEF, PLANS & INV'TS BRANCH

HOUSATONIC RIVER FLOOD CONTROL

EAST BRANCH DAM

DAM

GEOLOGIC-LOG SECTION

EAST BRANCH NAUGATUCK RIVER, CONNECTICUT

APPROVED
CHIEF, ENGINEERING DIVISION

DATE NOV 1961

SCALE

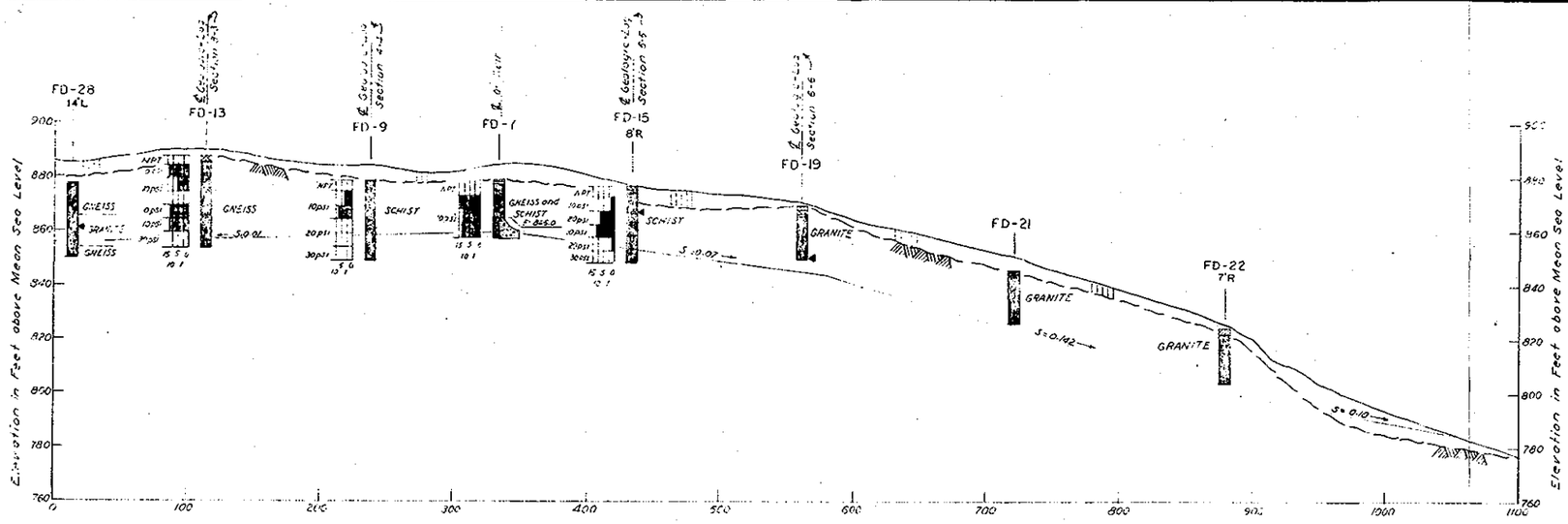
SPEC. NO. CIV. ENG.-19-016-

DRAWING NUMBER

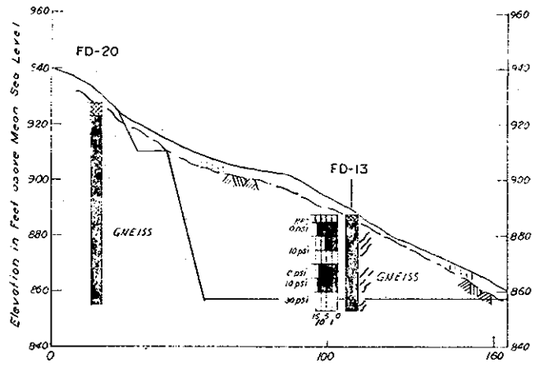
PLATE NO. 2-3

CORPS OF ENGINEERS

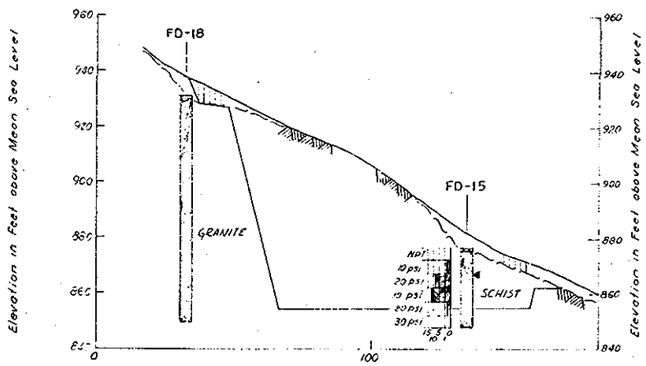
U. S. ARMY



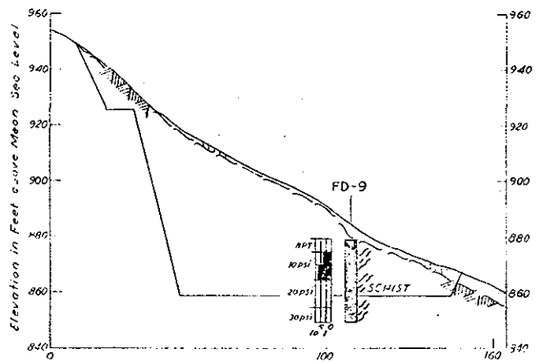
SECTION 2-2 ALONG SPILLWAY
(LOOKING EAST)



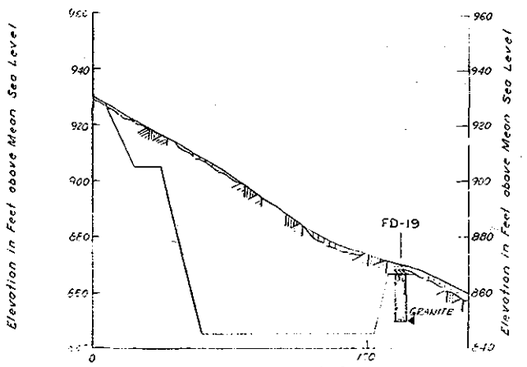
SECTION 3-3
(LOOKING UPSTREAM)



SECTION 5-5
(LOOKING UPSTREAM)



SECTION 4-4
(LOOKING UPSTREAM)



SECTION 6-6
(LOOKING UPSTREAM)

NOTES

For Record of Explorations, see Plates No. 2-6 and 2-7.

For Location of Geologic Sections, see Plate No. 2-2.

For Legends, see Plate No. 2-3.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M. | DR. BY R.A.W. | CK. BY R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, PLANS & SPECS BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

HOUSATONIC RIVER FLOOD CONTROL

EAST BRANCH DAM
SPILLWAY
GEOLOGIC-LOG SECTIONS

EAST BRANCH NAUGATUCK RIVER, CONNECTICUT

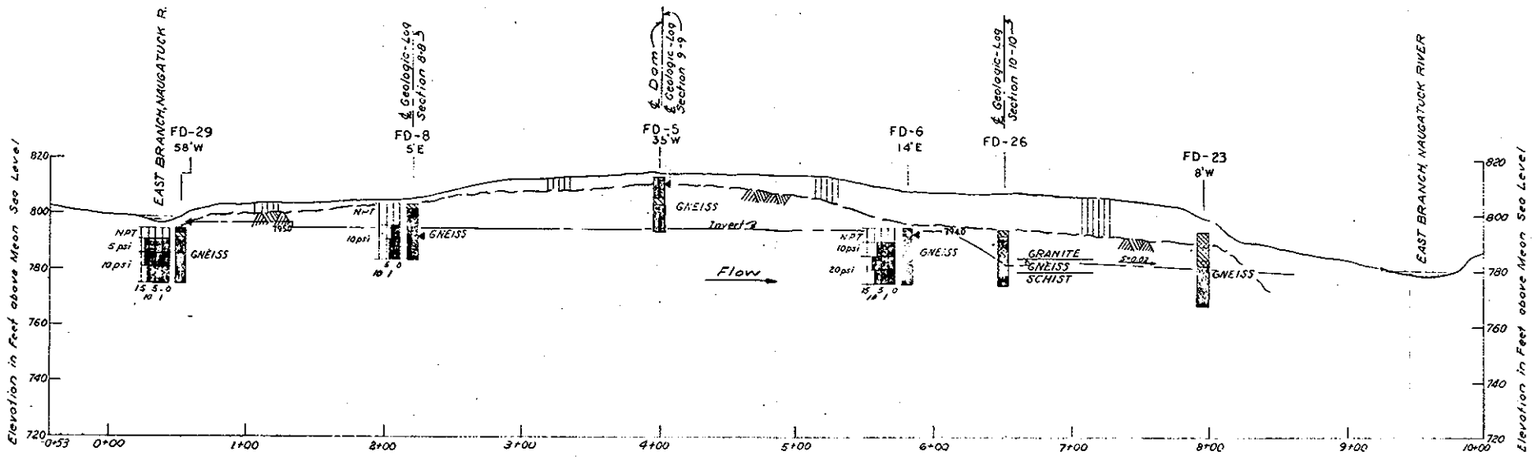
APPROVED
DATE NOV 1961

SCALE
SPEC NO. CIV ENG.-19-016-
DRAWING NUMBER

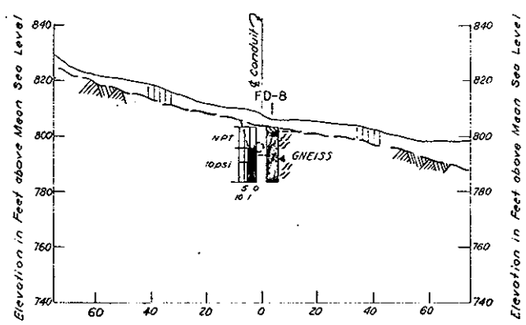
PLATE NO. 2-4

CORPS OF ENGINEERS

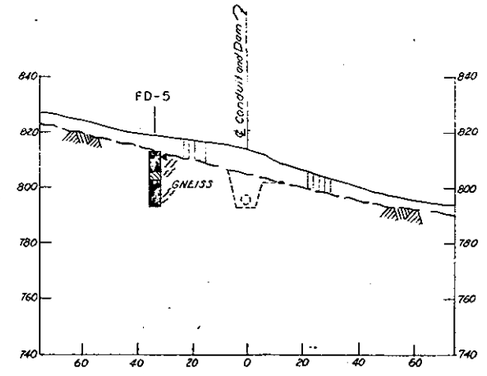
U.S. ARMY



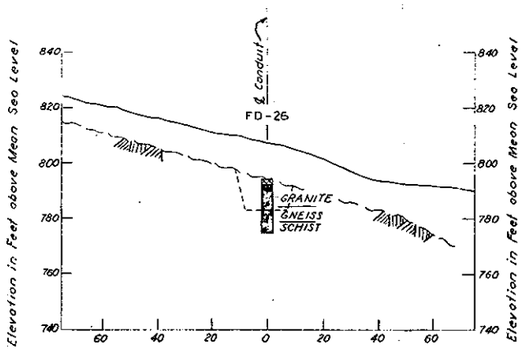
SECTION 7-7 ALONG ℄ OF CONDUIT
(LOOKING EAST)



SECTION 8-8 AT STA. 2+25
(LOOKING UPSTREAM)



SECTION 9-9 AT STA. 4+00
(LOOKING UPSTREAM)



SECTION 10-10 AT STA. 6+53
(LOOKING UPSTREAM)

NOTES

For Record of Foundation Explorations, see Plates No. 2-6 and 2-7.

For Location of Geologic Sections, see Plate No. 2-2.

For Legends, see Plate No. 2-3.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M.	DR. BY R.A.W.	CK. BY R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOUNDATION & MATERIALS BRANCH
APPROVAL RECOMMENDED
CHIEF, PLANS & SPECS. BRANCH

HOUSATONIC RIVER FLOOD CONTROL

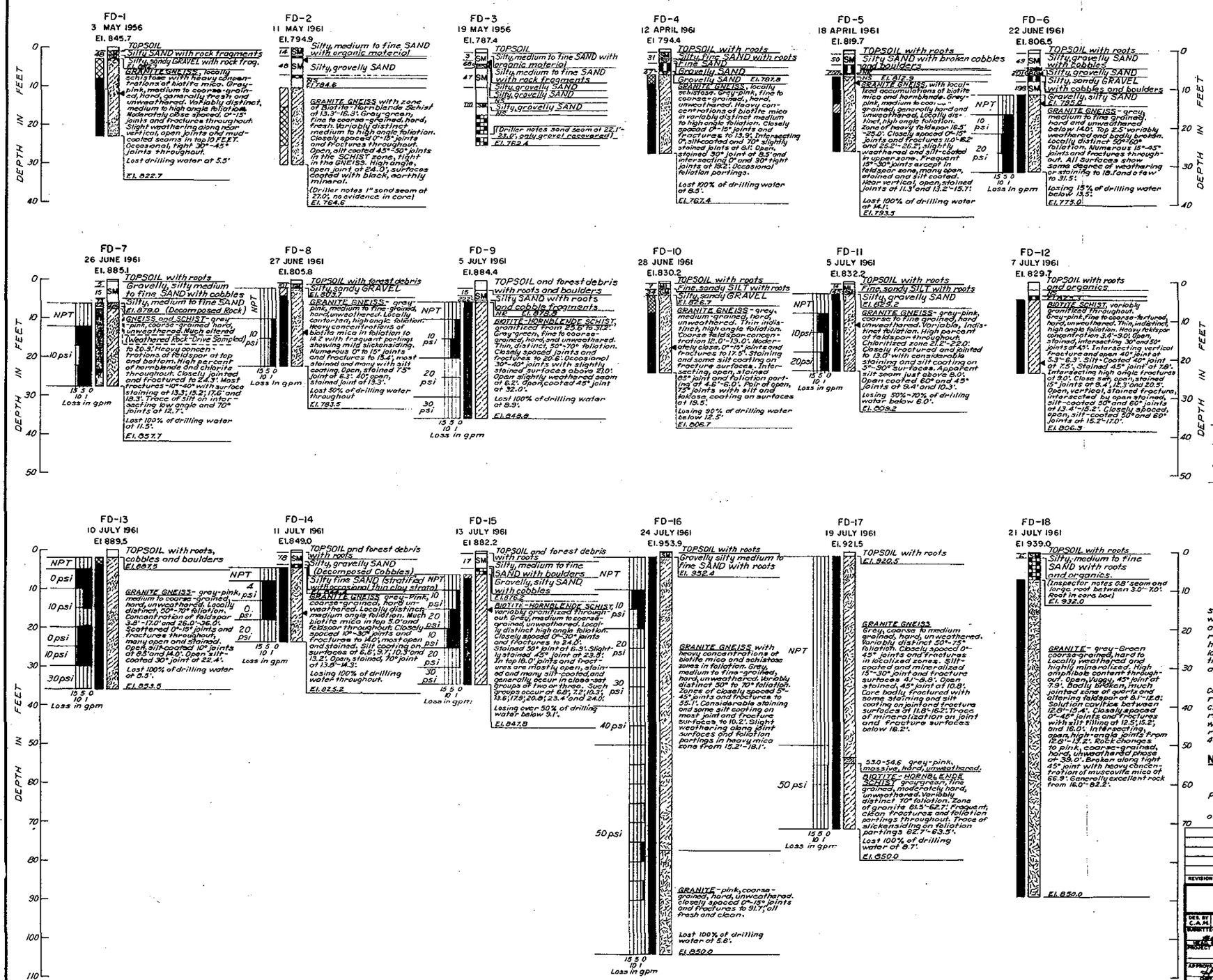
EAST BRANCH DAM
CONDUIT
GEOLOGIC-LOG SECTIONS

EAST BRANCH NAUGATUCK RIVER, CONNECTICUT

APPROVED
CHIEF, ENGINEERING DIVISION
DATE NOV 1961

SCALE
SPEC. NO. CIVENG.-19-016-
DRAWING NUMBER

PLATE NO. 2-5



LEGEND FOR GRAPHIC LOGS

FD-10 Foundation Test Boring.
BD-10 Borrow Test Boring.
BTT-1 Borrow Test Trench.
(OW) Observation well installed.
28 JUNE 1961 Date exploration completed.
El. 830.2 Elevation of ground surface during time of exploration.

- Maximum artesian head
- Subsurface water level in boring at time of exploration.
- Range of subsurface water during period of observation.
- Artesian flow encountered.
- SM Group letter symbol according to Unified Soil Classification System.
- NR No Recovery or unsatisfactory soils samples recovered.
- NS Not Sampled. Hole advanced by Core-drilling, blasting, and/or wash boring due to operational difficulty.
- Bottom of observation well.
- CD Sampling in overburden by Core-drilled method.
- 25 Blows per foot of penetration considered most representative for each sample drive using a 300 or 350 pound hammer with a free fall of about 18" on a 1⅜" ID or 2" OD, 2" ID or 2½" OD and/or 2½" ID or 3" OD, size sample spoon equipped with a beveled and sharpened drive shoe.
- Blow counts not recorded or not considered representative.
- Cobble or boulder (Core-drilled)
- Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped)
- El. 816.7 Elevation of bedrock surface
- Rock symbol
- El. 806.7 Elevation bottom of exploration
- Rock core recovery 0 - 25%
- Rock core recovery 25 - 50%
- Rock core recovery 50 - 75%
- Rock core recovery 75 - 90%
- Rock core recovery 90 - 100%

NPT No Pressure Test Performed.
* Asterisk denotes that section could not be sealed for testing.
20 psi Constantly maintained pressure for 1 to 5 minutes

Volume loss in gallons per minute under constant pressure, tested continuously in 5-foot sections.

Scale expanded from 0 gpm to 1 gpm for clarification of low pressure losses.

Water levels recorded during subsurface explorations seldom correspond with the natural level of free ground water, except in extensive and thick deposits of sands and gravels which are sufficiently pervious to permit rapid stabilization of water levels in the exploratory hole. Absence of subsurface water level in the graphic log of any exploration is not necessarily to be construed that ground water will not be encountered in excavation at that location.

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local minor variations characteristic of the overburden and rocks of this region are anticipated, and if encountered, such variations will not be considered as differing "Materially" from represented conditions within the purview of Article 4 of the Contract.

NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations, see Plate No. 2-2.

Standard NX diamond bits used for core drilling of rock except where otherwise indicated.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M. DR. BY E.D.S. CK. BY R.C.G.
SUBMITTED
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVAL RECOMMENDED

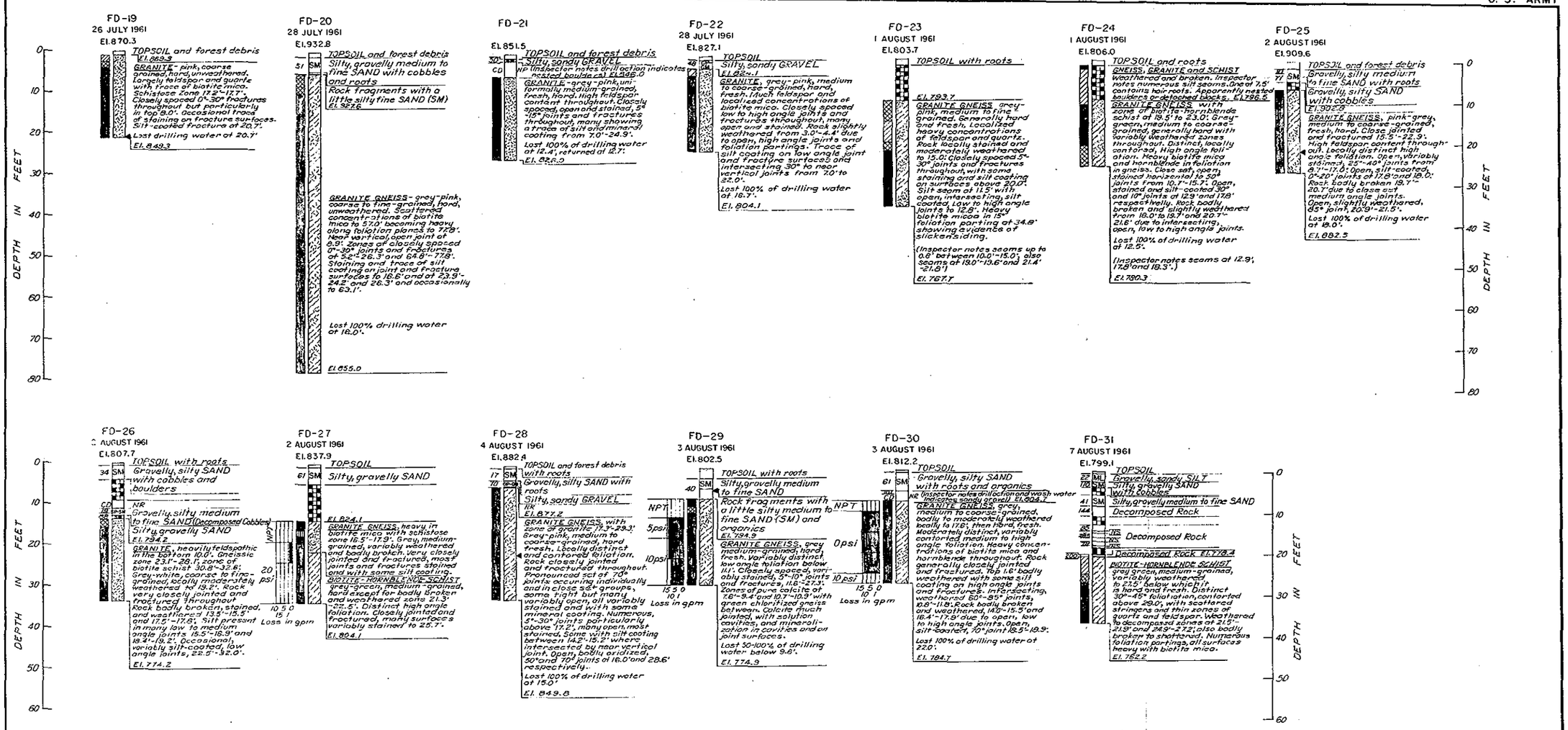
HOUSATONIC RIVER FLOOD CONTROL
EAST BRANCH DAM
RECORD OF FOUNDATION EXPLORATIONS
NO. 1
EAST BRANCH NAUGATUCK RIVER, CONNECTICUT
APPROVED
DATE NOV 1961

SCALE
SPEC. NO. CIV. ENG.-19-096-
DRAWING NUMBER

PLATE NO. 2-6

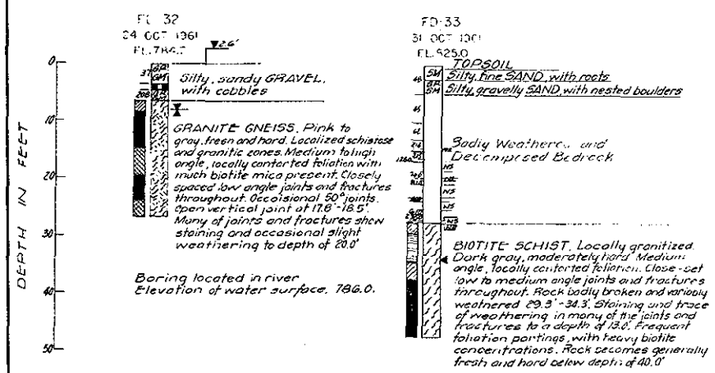
CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum
For Location of Foundation Explorations, see Plate No. 2-2
For Legend of Graphic Logs and Notes applicable to Subsurface Explorations, see Plate No. 2-6.



REVISION	DATE	DESCRIPTION	BY

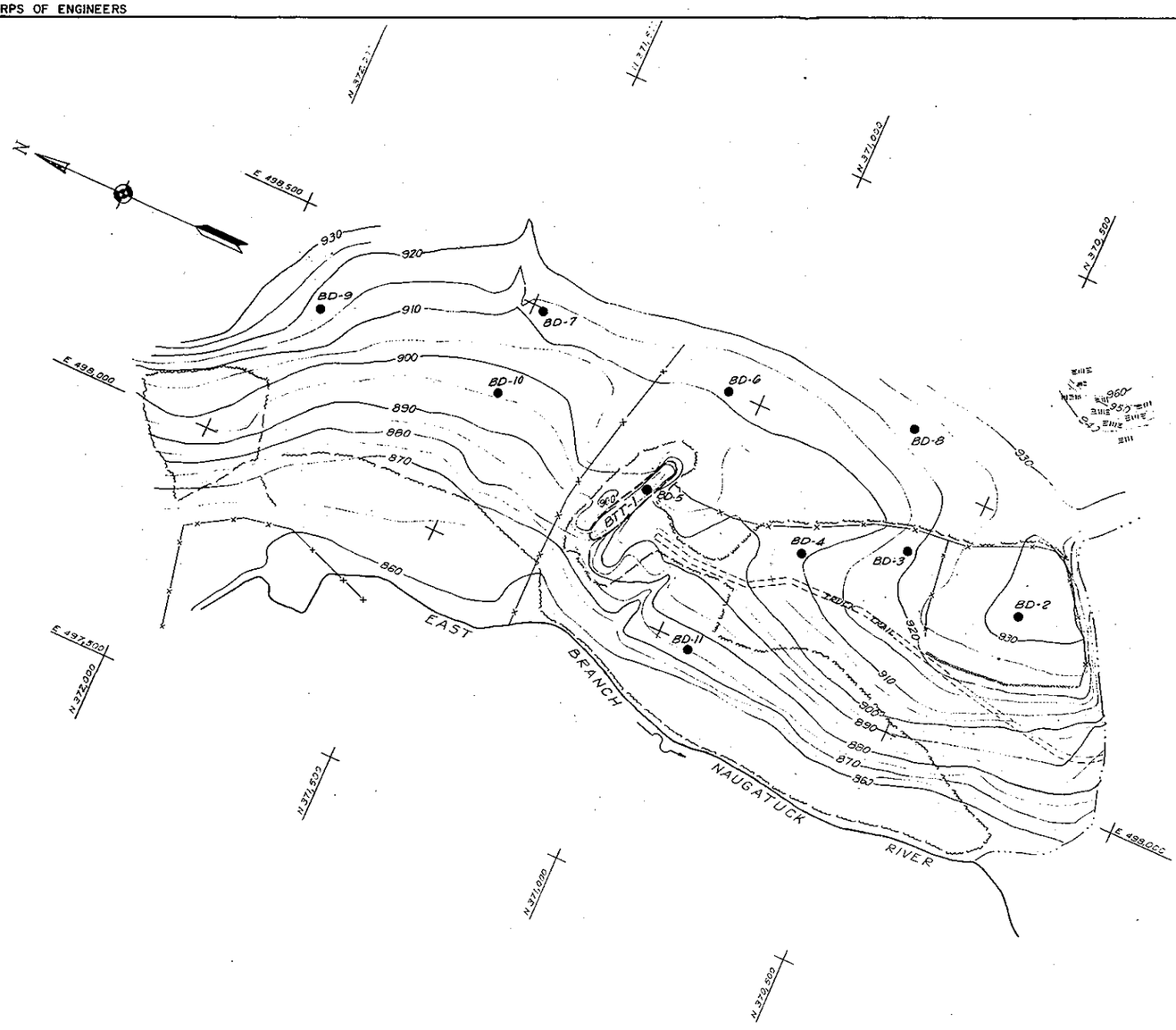
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.H.	DR. BY E.D.B.	CK. BY R.C.G.
SUBMITTED: HEAD, GEOLOGY SECTION		
PROJECT ENGINEER		
APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION		
APPROVAL RECOMMENDED: CHIEF, PLANN. & R.P.S. BRANCH		

HOUSATONIC RIVER FLOOD CONTROL
EAST BRANCH DAM
RECORD OF FOUNDATION EXPLORATIONS
NO 2
EAST BRANCH NAUGATUCK RIVER, CONNECTICUT
APPROVED: DATE NOV. 1961
SCALE
SPEC NO. CIV. ENG. -19-016-
DRAWING NUMBER

PLATE NO. 2-7

CORPS OF ENGINEERS U. S. ARMY



PLAN

SCALE IN FEET

LEGEND

- ● BD-2 Borrow Test Boring
- BTT-1 Borrow Test Trench, Power Excavated.
- Bedrock Outcrop

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval is 5 feet.
For Record of Borrow Explorations, see Plate No. 2-9
Boring BD-1 is located in area downstream of dam site.
Observation pipe for BD-5 was destroyed during excavation of Borrow Test Trench BTT-1.
For Location of Borrow Area, see General Plan and Reservoir Map, Plate No. 2-1.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.A.H.	R.D.B.	R.C.G.

SUBMITTED
Head, Geology Section
PROJECT ENGINEER
APPROVAL RECOMMENDED
Chief, Foundations & Materials Branch
APPROVAL RECOMMENDED
Chief, Plans & Specifications Branch

HOUSATONIC RIVER FLOOD CONTROL
EAST BRANCH DAM
PLAN OF BORROW EXPLORATIONS
EAST BRANCH NAUGATUCK RIVER, CONNECTICUT

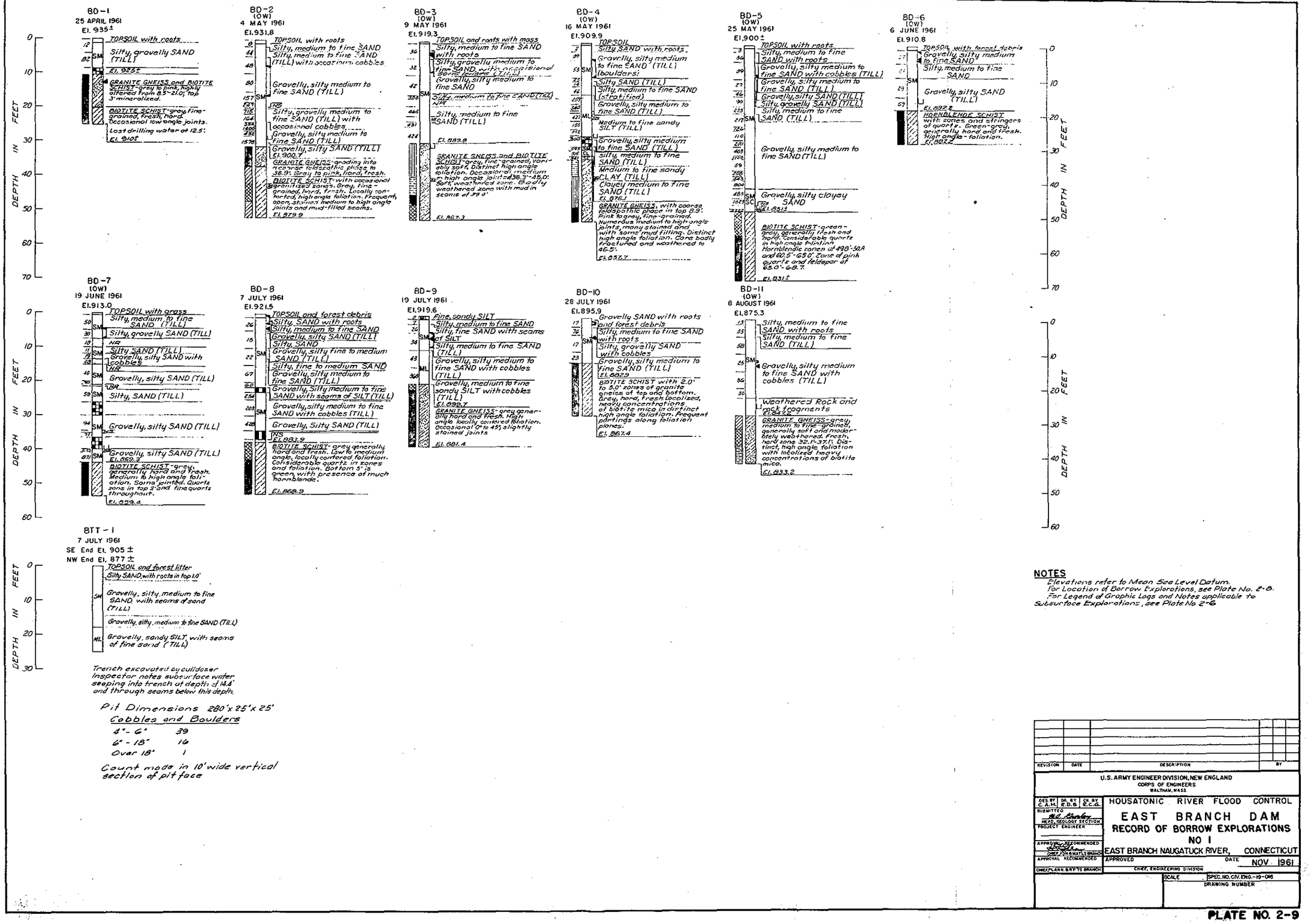
APPROVED DATE NOV 1961
CHIEF, ENGINEERING DIVISION

SCALE
SPEC NO CIV. ENG. 19-106
DRAWING NUMBER
SHEET

PLATE NO. 2-8

CORPS OF ENGINEERS

U. S. ARMY



BTT-1
7 JULY 1961
SE End El. 905 ±
NW End El. 877 ±

Trench excavated by bulldozer. Inspector notes subsurface water seeping into trench at depth of 14.4' and through seams below this depth.

Pit Dimensions 280'x 25'x 25'

Cobbles and Boulders

4"-6"	39
6"-18"	16
Over 18"	1

Count made in 10' wide vertical section of pit face

NOTES

Elevations refer to Mean Sea Level Datum.
For Location of Borrow Explorations, see Plate No. 2-8.
For Legend of Graphic Logs and Notes applicable to Subsurface Explorations, see Plate No. 2-6

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.H. | DR. BY E.D.B. | CK. BY E.C.G.

SUBMITTED
H.D. Baker
HEAD, GEOLOGY SECTION
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, CONSTR. & MAT'LS BRANCH
APPROVAL RECOMMENDED
CHIEF, PLANN. & RPTS BRANCH

HOUSATONIC RIVER FLOOD CONTROL

EAST BRANCH DAM
RECORD OF BORROW EXPLORATIONS NO 1

EAST BRANCH NAUGATUCK RIVER, CONNECTICUT

APPROVED
DATE NOV 1961
CHIEF, ENGINEERING DIVISION

SCALE
SPEC. NO. CIV. ENG. - 19 - 016
DRAWING NUMBER

PLATE NO. 2-9